

**Review of the morid cods
(Teleostei, Paracanthopterygii, Moridae)
of New Caledonia, southwest Pacific Ocean,
with description of a new species of *Gadella***

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ABSTRACT

Morid cods, family Moridae, of the New Caledonian Exclusive Economic Zone are reviewed based on fresh specimens obtained during exploratory fishing by ORSTOM and preserved specimens held in research collections in Paris, Nouméa and Wellington. The following eleven species in six genera are described: *Gadella brocca* new species, endemic; *Gadella norops* Paulin, southern Indian Ocean and southwestern Pacific Ocean; *Laemonema filodorsale* Okamura, new record, western Pacific; *Laemonema palauense* Okamura, western Pacific Ocean; *Lepidion inosimae* (Günther), new record, western Pacific Ocean; *Mora moro* (Risso), new record, northwest Atlantic Ocean, Mediterranean Sea, southern Indian Ocean and South Pacific Ocean; *Physiculus longifilis* Weber, new record, Flores Sea and northern Australia; *Physiculus luminosus* Paulin, new record,.

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South Pacific Ocean; *Physiculus roseus* Alcock, new record, Indian Ocean, South China Sea, Phillipines; *Physiculus therosideros* Paulin, southwestern Pacific Ocean; *Tripterothycis svetovidovi* Sazanov & Shcherbachev, new record, warm temperate South Atlantic, Indian and Pacific Oceans. A key to the species is provided.

RÉSUMÉ

Révision des moridés (Teleostei, Paracanthopterygii, Moridae) de Nouvelle-Calédonie (Océan Pacifique Sud-Ouest), avec la description d'une espèce nouvelle du genre *Gadella*.

Les poissons de la famille des Moridae provenant de la Zone Économique Exclusive de Nouvelle-Calédonie sont révisés en se basant sur des spécimens frais, capturés lors des campagnes d'exploration de l'ORSTOM, et sur des spécimens fixés provenant des collections de Paris, Nouméa et Wellington. Onze espèces appartenant à six genres sont décrites. Une espèce est endémique et nouvelle : *Gadella brocca* n. sp. Trois espèces ont déjà été répertoriées dans la région : *Gadella norops* Paulin, présente dans le sud de l'Océan Indien et le Pacifique Sud-Ouest ; *Laemonema palauense* Okamura, signalée dans l'ouest du Pacifique ; et *Physiculus therosideros* Paulin, présente dans le sud-ouest du Pacifique. Sept espèces sont signalées pour la première fois dans la région : *Laemonema filodorsale* Okamura et *Lepidion inosimae* (Günther), présentes dans le Pacifique Ouest ; *Mora moro* (Risso), de l'Atlantique Nord-Ouest, de la Méditerranée, du sud de l'Océan Indien et du Pacifique Sud ; *Physiculus longifilis* Weber, d'Indonésie et du nord de l'Australie ; *Physiculus luminosus* Paulin, du Pacifique Sud ; *Physiculus roseus* Alcock, de l'Océan Indien et du nord de l'Australie ; *Tripterothycis svetovidovi* Sazanov & Shcherbachev, des eaux tempérées chaudes du sud de l'Océan Atlantique, Océan Indien et du Pacifique Sud. Une clef des espèces est jointe à cette étude.

INTRODUCTION

The 200 mile Exclusive Economic Zone (EEZ) of New Caledonia covers an area of over 1.7 million km² and contains a complex and varied seabed morphology including coral reefs, seamounts and deep ocean basins. There is, therefore, a great diversity of habitats and associated fauna, particularly fishes, present in the zone. However, the fish fauna of the region has received little attention, until recently. Since the late 1970's, fish collecting has been carried out as part of exploratory research programmes run by ORSTOM Nouméa, ORSTOM Paris and the Muséum National d'Histoire Naturelle, Paris, in both lagoon and deep water, including offshore seamounts (RICHER DE FORGES, 1990). Morid cods have been present in many of the deep water collections, but difficulties associated with their superficially similar morphology and inadequate taxonomic treatment, has frequently hindered accurate identification.

As part of cooperative research programmes between ORSTOM Centre de Nouméa and the Museum of New Zealand Te Papa Tongarewa (formerly the National Museum of New Zealand), morids were observed and collected by the authors who participated in exploratory deep water fishing on seamounts during R. V. "Alis" cruises BERYX 2 and BERYX 11. Also, preserved specimens collected during recent research cruises in the New Caledonian EEZ and held by ORSTOM Nouméa, ORSTOM Paris and the Muséum National d'Histoire Naturelle, Paris, were studied. This new material provides the basis for the present review and enables the morid cods of New Caledonia to be critically treated for the first time.

METHODS

Counts and measurements follow the methods used by HUBBS & LAGLER (1964) and PAULIN (1983), accurate counts of scale rows from damaged specimens are difficult to make and these approximate data are denoted by "ca." in the text, and vertebral counts exclude both ural centra. Morphometric data in the text are expressed as ranges and are given in mm, with percent standard length in parentheses. Otolith morphology has been found to be useful in identifying morid genera (KARRER, 1971; FITCH & BARKER, 1972; PAULIN, 1983) and, therefore, otoliths were sampled where possible in the present study. Otoliths were removed from freshly thawed specimens when

available, cleaned, stored dry, illustrated and described; otolith nomenclature follows KARRER (1971). Synonymies include valid name, primary synonyms, and New Caledonian, Australian and New Zealand nomenclature. Specimens examined are listed under each species account, the number of specimens is given and those specimens X-rayed are denoted by an asterisk. The Eucla cod, family Euclichthyidae, is similar to morid cods in body shape and appearance, however, several internal characters (COHEN, 1984) indicate that it is only distantly related and it is, therefore, reviewed separately (ROBERTS & PAULIN, this volume).

Institutional abbreviations follow the international standards fixed by LEVITON *et al.* (1985).

SYSTEMATIC ACCOUNT

Family MORIDAE

NOTE: the family Moridae is herein used *sensu* PAULIN (1989).

DIAGNOSIS. — Gadiform fishes with symmetrical anal fin (either single or divided into two equal portions), symmetrical caudal fin, a horizontal diaphragm within the posterior chamber of the swim bladder (PAULIN, 1988), swim bladder-auditory capsule connection present, caudal skeleton with four or five hypurals and X-Y bones, a jointed first neural spine, and a double sulcus groove present on otoliths.

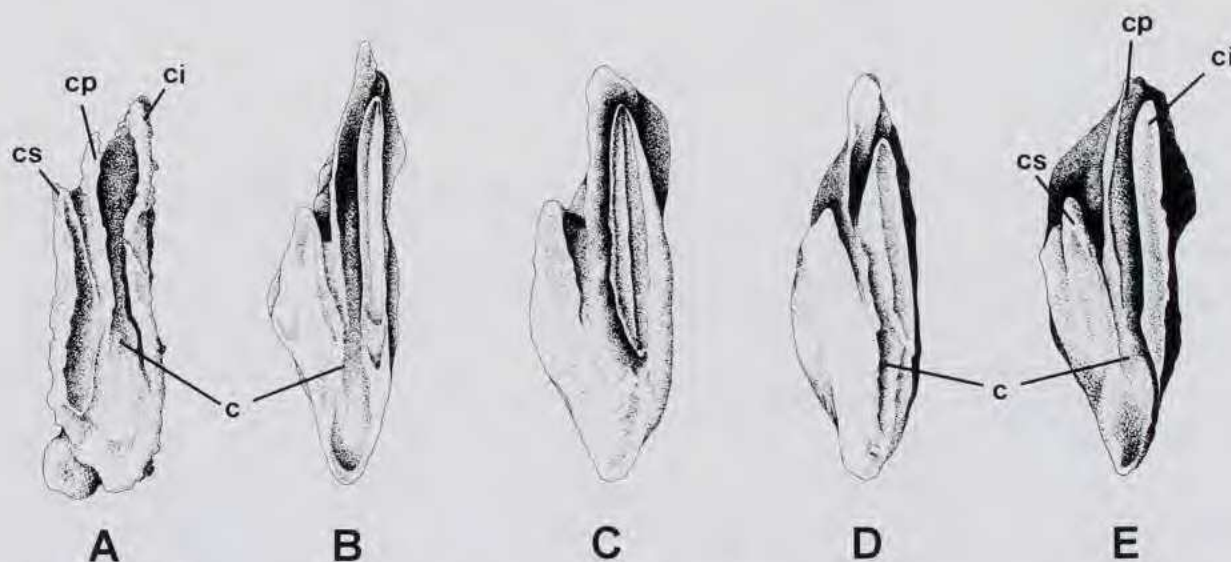


FIG. 1. — Otoliths from New Caledonian morids; left otolith in medial view. — A: *Lepidion inosimae* (Günther, 1887), specimen of 605 mm SL (MNHN 1995-000), otolith length 23.5 mm. — B: *Gadella norops* Paulin, 1987, specimen of 228 mm SL (NMNZ-P.27491), otolith length 9.0 mm. — C: *Laemonema filodorsale* Okamura, 1982, specimen of 235 mm SL (NMNZ-P.27423), otolith length 11.2 mm. — D: *Physiculus therosideros* Paulin, 1987, specimen of 165 mm SL (NMNZ-P.27454), otolith length 9.3 mm. — E: *Trypterophycis svetovidovi* Sazanov & Shcherbachev, 1986, specimen of 233 mm SL (NMNZ-P.27443), otolith length 7.5 mm. Abbreviations: c, collum; ci, crista inferior; cp, colliculum posterior; cs, crista superior.

REMARKS. — Moridae intrarelationships are poorly understood. The family Euclichthyidae, comprising the monotypic *Eucla* cod, is superficially similar to morid cods and has been proposed as the sister family (MARKLE, 1989: fig. 19), but other workers using mostly different characters have found conflicting results. COHEN (1984) indicated that the two families are only distantly related; HOWES (1989: fig. 10) concurred, and proposed the Bathygadidae as the morid sister group.

The family Moridae comprises about 17 genera and 95 species (PAULIN, 1989a; COHEN *et al.*, 1990). Morids are benthopelagic to pelagic at 0-2,500 m depth, are found in all oceans, and some are commercially important. In the New Caledonian region morids are an important component of deep slope and seamount fish faunas. In the present review, 11 species in six genera are described and the otoliths of five species are illustrated (Fig. 1), four of these for the first time.

Genus *GADELLA* Lowe, 1843

Gadella Lowe, 1843: 91 (feminine, type species *Gadella gracilis* Lowe by monotypy).

DIAGNOSIS. — Morid fishes with thick, pointed, spindle shaped otoliths (ostium one third or less of otolith length) (Fig. 1B); a small ventral light organ in advance of the anus; two dorsal fins and one anal fin; ventral fins with outer two rays filamentous; barbel absent.

REMARKS. — Related to *Physiculus* Kaup and *Salilota* Günther on the basis of shared otolith and light organ specializations (PAULIN, 1989a; 1989b); comprising nine species occurring in subtropical and tropical seas worldwide, some restricted in distribution to island chains and submarine ridges.

Gadella brocca sp. nov.

Fig. 2, Table 1

MATERIAL EXAMINED. — 5 specimens, 100.0-172.5 mm SL.

Norfolk Ridge. AZTÈQUE: stn 7, 23°37.5'S, 167°42.1'E (Stylaster seamount, southeast of New Caledonia), 425-500 m depth, otter trawl, R. V. "Alis", 14 February 1990: holotype, 172.5 mm SL (MNHN 1995-1002)*.

New Caledonia. BATHUS 1: stn 660, 21°10.48'S, 165°53.19'E (off central west coast Grande Terre), 790 m depth, beam trawl, R. V. "Alis", 13 March 1993: 3 paratypes, 100.0-131.5 mm SL (MNHN 1995-1003)*. — 1 specimen, 143 mm SL (NMNZ-P.31380)*, same data as other 3 paratypes.

DIAGNOSIS. — A species of *Gadella* with a single row of large, irregular canine-like teeth in upper and lower jaws and a small triangular patch of minute teeth at symphysis of lower jaw; eye small, orbit diameter 4.7-5.3 % SL; interorbital broad, 5.1-8.6 % SL.

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly longer than diameter of eye. Teeth in a single row, large, irregular canine-like, in upper and lower jaws and a small triangular patch of minute teeth at symphysis of lower jaw. First dorsal fin origin behind pectoral insertion, first ray minute, second longest. Second dorsal fin commences immediately behind first, posterior fin rays longest. Anal fin commences immediately behind anus, height only slightly depressed along middle of its length and posterior fin rays longest. Caudal fin rounded. Pelvic fins just reaching anus. Ventral light organ minute, placed slightly in advance of anus, well behind pelvic fin insertions.

Measurements and meristics. Morphometric and meristic characters of the holotype and four paratypes are given in Table 1.

Coloration (from preserved specimens). Upper half of head and body pale creamish tan, lower portion dark bluish grey; lips, branchiostegal membranes, orbit rim, insertion of pectoral and pelvic fins, light organ and anus black; dorsal and anal fins black; caudal and paired fins greyish blue; remaining scale pockets black.

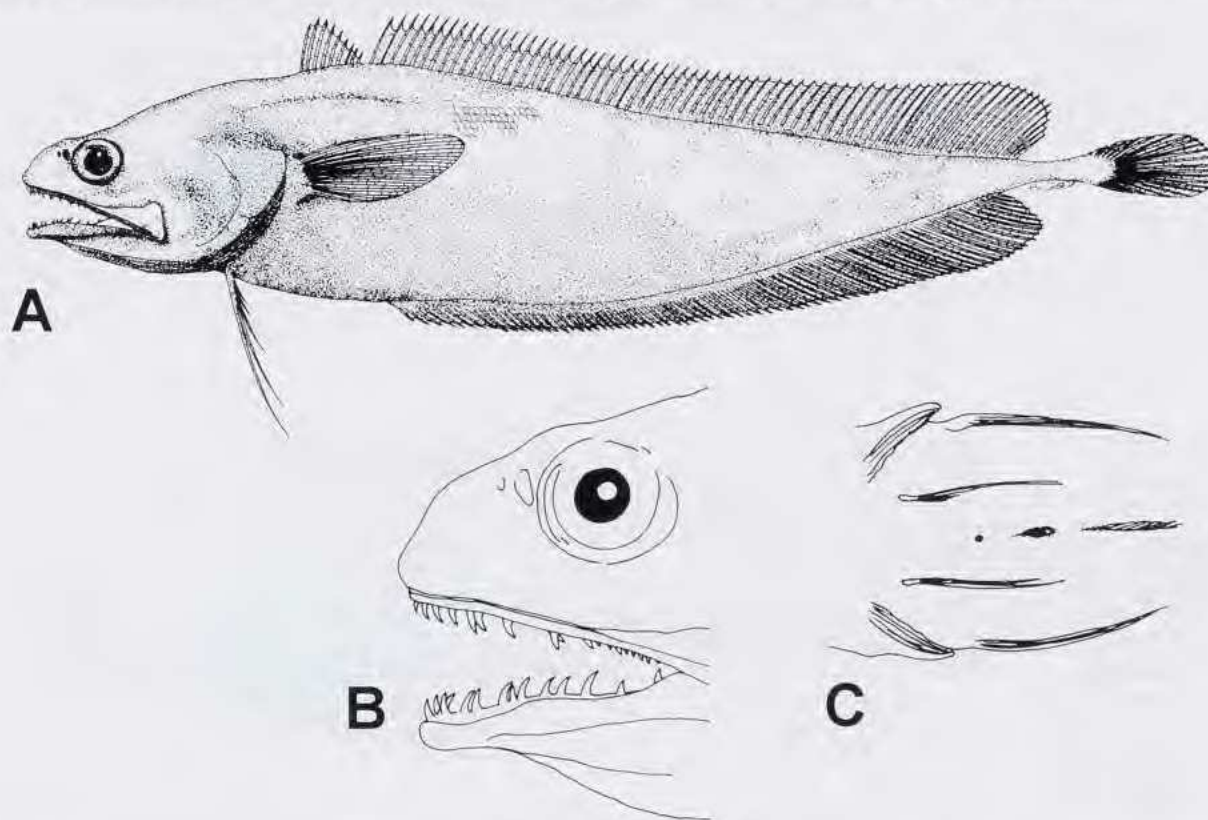


FIG. 2. — *Gadella brocca* sp. nov., holotype, 172.5 mm SL (MNHN 1995-1002), Stylaster seamount, southeast of New Caledonia, 425-500 m depth, AZTEQUE, stn 7. — A: whole fish in left lateral view. — B: lateral view of head, showing teeth on jaws. — C: ventral view of light organ.

DISTRIBUTION. — Known from five specimens, one taken on the Stylaster seamount southeast of New Caledonia at 425-500 m depth (GRANDPERRIN *et al.*, 1990), and four off the central west coast of Grande Terre, New Caledonia, at 790 m depth.

REMARKS. — *Gadella brocca* n. sp. differs in its dentition from other known species of the genus occurring within the Indo-Pacific region: *G. edelmanni* (Brauer), *G. filifer* (Garman), *G. norops* Paulin, *G. obscurus* (Parin), and *G. jordani* (Boehlke & Mead); *G. brocca* has a single row of large, irregular prominent teeth in both jaws (Fig. 2B), all other species in the Indo-Pacific region have a band of villiform teeth in 4-9 rows (PAULIN, 1989b). The dentition of *G. brocca* is similar to that of *G. imberbis* (Vaillant) (Caribbean Sea and tropical Atlantic Ocean) and *G. maraldi* (Risso) (Mediterranean Sea and Northeast Atlantic Ocean) (PAULIN, 1989b; COHEN *et al.*, 1990). *Gadella brocca* differs from these two latter species in having a single row of caniniform teeth on both jaws (vs bands of villiform teeth on both jaws, and some caniniform teeth only on upper jaws). *Gadella brocca* further differs from *G. maraldi* in eye diameter (4.7-5.3% SL vs 6.8-7.9% SL). PAULIN (1989b: 130) distinguished two groups of *Gadella*: Indo-Pacific species with small light organs, undifferentiated bands of villiform teeth, and higher numbers of fin rays, vertebrae and scales; and Atlantic species with two rows of differentiated villiform and caniniform teeth, lower meristic counts, and larger light organs. With the exception of its dentition, *G. brocca* falls into the first group. However, its teeth are sufficiently different in configuration and position from those in the Atlantic group to suggest independent origin.

ETYMOLOGY. — From Latin *broccus* (projecting teeth) in reference to the prominent dentition.

TABLE 1. — Morphometric and meristic characters of type specimens of *Gadella brocca* sp. nov. from New Caledonia. (D = damaged).

	Holotype MNHN 1995-1002		Paratype NMNZ P.31380		Paratype MNHN 1995-1003		Paratype MNHN 1995-1003		Paratype MNHN 1995-1003		Min - Max	
Standard length (mm)	172.5		143.0		131.5		127.0		100.0		100.0-172.5	
MORPHOMETRIC CHARACTERS												
in mm and % SL	mm	%	mm	%	mm	%	mm	%	mm	%	%	
Head length	45.6	26.4	27.0	18.8	25.5	19.4	25.0	19.6	17.3	17.3	17.3-26.4	
Head width	30.5	17.7	18.5	13.2	14.3	10.8	14.5	11.4	11.1	11.1	10.8-17.7	
Body depth	31.8	18.4	24.0	16.7	20.0	15.2	18.4	14.4	15.9	15.9	14.4-18.4	
Caudal peduncle depth	2.9	1.7	1.8	1.2	1.7	1.2	1.3	1.0	1.4	1.4	1.0-1.7	
Orbit diameter	9.0	5.2	6.8	4.7	7.1	5.3	6.2	4.8	5.0	5.0	4.7-5.3	
Interorbital width	14.9	8.6	7.3	5.1	7.0	5.3	6.6	5.1	6.4	6.4	5.1-8.6	
Snout length	11.0	6.4	6.9	4.8	5.8	4.4	7.0	5.5	5.1	5.1	4.4-6.4	
Maxilla length	27.1	15.7	13.5	9.4	12.1	9.2	12.5	9.8	9.6	9.6	9.2-15.7	
Pectoral fin length	30.0	17.4	22.1	15.4	18.0	13.6	21.1	16.5	17.6	17.6	13.6-17.6	
Pelvic fin length	14.4	8.3	7.8	5.4	D	-	5.1	4.0	D	-	4.0-8.3	
Longest ray of D ₁ length	12.5	7.2	4.3	3.0	6.1	4.6	4.5	3.5	5.2	5.2	3.0-7.2	
Longest ray of D ₂ length	11.0	6.8	7.6	5.3	10.0	7.6	9.8	7.7	7.3	7.3	5.3-7.7	
Longest anal fin ray length	11.9	6.9	7.9	4.8	10.1	7.6	8.9	7.0	7.9	7.9	4.8-7.9	
Predorsal length	48.5	28.1	35.0	24.4	35.0	26.6	26.8	21.1	24.4	24.4	21.1-28.1	
Preanal length	62.1	36.0	40.5	28.3	38.5	29.2	42.6	33.5	35.0	35.0	28.3-36.0	
Light organ diameter	1.0	0.6	0.9	0.6	0.8	0.6	D	-	D	-	0.6-0.6	
Light organ - interpelvic length	12.0	7.0	10.5	7.3	8.1	6.1	D	-	D	-	6.1-7.3	
MERISTIC CHARACTERS												
First dorsal fin rays	1 + 9		1 + 8		1 + 9		1 + 9		1 + 9		1 + 8-9	
Second dorsal fin rays	70		73		75		71		74		70-75	
Anal fin rays	77		78		77		78		77		77-78	
Pectoral fin rays	25		25		26		26		25		25-26	
Pelvic fin rays	5		6		6		6		6		5-6	
Gill rakers	4 + 10		4 + 12		3 + 9		4 + 10		4 + 10		3-4 + 9-12	
Longitudinal scale rows	ca. 90		ca. 94		D		D		D		ca. 90 - ca. 94	
Vertebrae (excl. ural centra)	57		55		57		56		56		55-57	

Gadella norops Paulin, 1987

Fig. 3

Gadella norops Paulin, 1987: 75 (original description, Port Hedland, Western Australia); 1989b: 101, figs 4-5 (description).

MATERIAL EXAMINED. — 6 specimens, 193.5-268.0 mm SL.

Norfolk Ridge. BERYX 2: stn 18, 24°56.4'S, 168°21.0'E (Seamount "B"), 564-586 m depth, otter trawl, R. V. "Alis", 30 October 1990: 1 specimen (NMNZ-P.27491)*.

AZTEQUE: stn 1, 23°13.3'S, 168°04.6'E (Azteque Seamount), 290-460 m depth, otter trawl, R. V. "Alis", 12 February 1990: 2 specimens (MNHN 1995-1004). — Stn 4, 23°42.5'S, 168°01.2'E (Jumeaux seamount), 235-400 m depth, otter trawl, 13 February 1990: 3 specimens (MNHN 1995-1005).

DIAGNOSIS. — A species of *Gadella* with a band of villiform teeth in both upper and lower jaws; light organ small; dorsal fin not elongate; second dorsal fin rays 70-77 (cf. 72-77, PAULIN, 1987); width of interorbital 6.8-10.7% SL (cf. greater than 7.9% SL PAULIN, 1987).

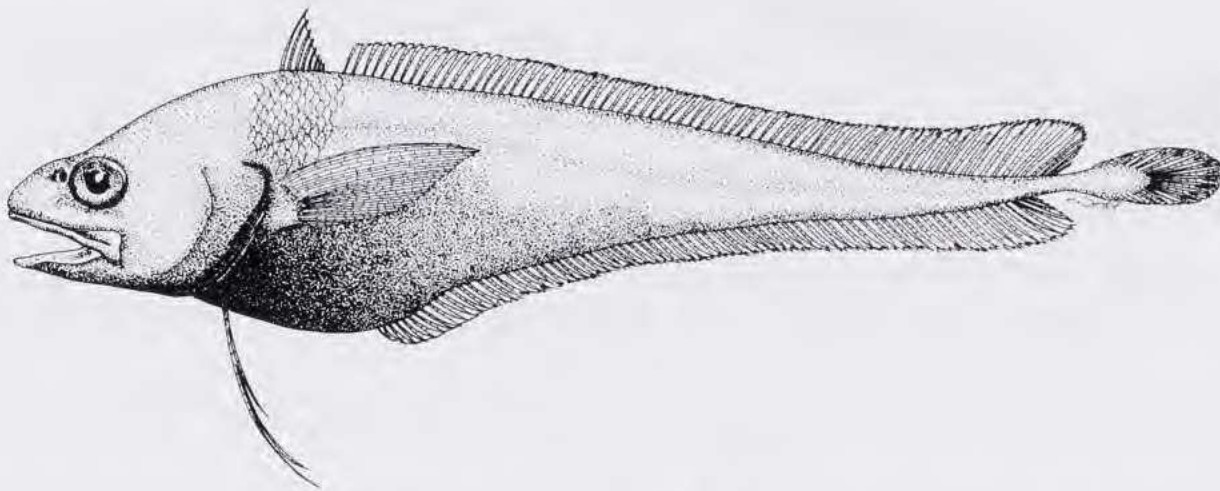


FIG. 3. — *Gadella norops* Paulin, 1987, specimen of 228 mm SL (NMNZ-P.27491), seamount "B", southeast of New Caledonia, 564-586 m depth, BERYX 2, stn 18.

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, longer than diameter of eye. Teeth villiform, in bands on upper and lower jaws. First dorsal fin origin behind pectoral insertion, first ray minute, second longest. Second dorsal commences immediately behind first, height greatest at posterior. Anal fin commences immediately behind anus, height only slightly depressed along middle of its length, greatest height of fin posteriorly (around rays 60-65). Caudal fin rounded. Pelvic fins reaching beyond anus to about tenth anal fin ray.

Measurements (in mm, % SL in parenthesis). Standard length 193.5-268.0; head length 39.8-58.3 (21.4-28.6), width 23.1-39.8 (10.7-17.0); body depth 30.0-51.2 (12.7-21.8); caudal peduncle depth 3.1-5.1 (1.4-2.1); orbit diameter 8.3-10.6 (3.5-4.5); interorbital width 16.1-28.7 (6.8-10.7); snout length 13.4-18.8 (5.6-8.1); maxilla length 24.5-31.1 (10.6-13.2); length of pectoral fin 33.2-50.6 (16.9-19.4); length of pelvic fin 33.8-57.2 (14.8-21.3); length of longest ray of first dorsal 8.0-21.0 (3.3-8.9), second 19.2-29.2 (8.9-12.6); length of longest ray of anal fin 17.1-25.1 (7.7-9.7); predorsal length 55.2-66.8 (25.1-28.5); preanal length 65.0-85.2 (28.7-36.4).

Meristics. First dorsal fin rays 1 + 8-9; second dorsal fin rays 70-76; anal fin rays 70-73; pectoral fin rays 19-23; pelvic fin rays 5-6; oblique scale rows in longitudinal series ca. 127-129; gill rakers 4-5 + 10-13; vertebrae 59-61.

Coloration (from fresh and frozen specimens). Lower head and abdomen dark blue-black, sides silvery, dorsal surface dark tan, fins pinkish.

Coloration (from preserved specimens). Body pale tan with darker scale pockets, lower head and abdomen dark blue-black, silvery patch at pectoral insertion, fins pale tan to dusky.

DISTRIBUTION. — *Gadella norops* is the most widely distributed species in the genus *Gadella* and is known from scattered locations in the Indo-Pacific region, occurring from the Mascarene Ridge off India, to Australia, New Caledonia and New Zealand at 200-750 m depth (PAULIN, 1989b).

REMARKS. — *Gadella norops* can be distinguished from the sympatric *G. brocca* by its dentition consisting of bands of villiform teeth in both jaws, rather than a single row of large irregular caniniform teeth.

Genus *LAEMONEMA* Günther in Johnson, 1862

Laemonema Günther in Johnson, 1862: 171 (neuter, type species *Laemonema robustum* Johnson by monotypy).

DIAGNOSIS. — Morid fishes with blunt spindle shaped otoliths (Fig. 1C); two dorsal fins, the first short based, the second and the single anal fin long based; no ventral light organ; pelvic fins reduced to two long rays.

REMARKS. — A poorly known genus that is probably polyphyletic; comprising 18 poorly known species that are benthopelagic on continental slopes and oceanic ridges in tropical and temperate seas worldwide; some with limited distributions (PAULIN, 1989a; COHEN *et al.*, 1990).

Laemonema filodorsale Okamura, 1982

Fig. 4

Laemonema filodorsale Okamura, 1982: 133, pl. 82 (original description, Kyushu-Palau Ridge, Pacific Ocean).

MATERIAL EXAMINED. — **Norfolk Ridge.** BERYX 2: stn 3, 24°55.2'S, 168°21.0'E (Seamount "B"), 561-588 m depth, otter trawl, R. V. "Alis", 24 October 1990: 1 specimen, 231 mm SL (NMNZ-P.27423)*.

DIAGNOSIS. — A species of *Laemonema* with enlarged conical teeth in outer series of both jaws; snout scaled dorsally; two dorsal fins separated at base, second dorsal ray prolonged; pelvic fins barely reaching anus; 51-56 second dorsal fin rays.

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly shorter than diameter of eye. Barbel present on chin. Teeth villiform, in bands on jaws, a small rounded patch on vomer. First dorsal fin origin behind pectoral insertion, first ray minute, second longest, about two thirds length of head. Second dorsal commences immediately behind first, height more or less uniform throughout its length. Anal fin commences immediately behind anus, height depressed along middle of its length. Caudal fin slightly rounded. Pelvic fins reduced to two long rays, just reaching to level of anus.

Measurements (in mm, % SL in parenthesis). Standard length 231.0; head length 61.4 (26.5), width 37.0 (16.0); body depth 53.1 (22.9); caudal peduncle depth 5.6 (2.4); orbit diameter 16.4 (7.1); interorbital width 8.6 (3.7); snout length 12.4 (5.3); maxilla length 29.5 (12.7); length of pectoral fin 45.8 (19.8); length of pelvic fin

53.4 (23.1); length of longest ray of first dorsal 44.1 (19.0), second 20.5 (8.8); length of longest ray of anal fin 21.0 (9.0); predorsal length 68.0 (29.4); preanal length 110.0 (47.6).

Meristics. First dorsal fin rays 1 + 5; second dorsal fin rays 54; anal fin rays 51; pectoral fin rays 25; pelvic fin rays 2; oblique scale rows in longitudinal series 127; gill rakers 5 + 14; vertebrae 52.

Coloration (from fresh and frozen specimens). Head and body pale pink, darker pink along midline and around suboperculum, remaining scale pockets dark greyish brown. First dorsal fin greyish black with the first ray white; second dorsal fin greyish black with thin band of white marginally; anal fin dark grey, pale pink anteriorly, basally and at margin; caudal fin dark grey with thin white margin; pectoral fin dark grey, rays with reddish tips.

Coloration (from preserved specimens). Head and body pale, snout and orbit brown. Fins brownish with pale margins.



FIG. 4. — *Laemonema filodorsale* Okamura, 1982, specimen of 231 mm SL (NMNZ-P.27423), seamount "B", southeast of New Caledonia, 561-588 m depth, BERYX 2, stn 3.

DISTRIBUTION. — *Laemonema filodorsale* has an anti-equatorial distribution in the western Pacific Ocean; it is known from a small number of specimens taken on the Kyushu-Palau Ridge (OKAMURA, 1982) and off New Caledonia (this study) at 336-710 m depth.

REMARKS. — OKAMURA (1982) noted this species occurred sympatrically with *L. palauense*, but at different depths. However, the depth ranges given by OKAMURA and those found during the present study show great overlap between the two species (e.g., *L. filodorsale* 336-710 m, cf. *L. palauense* 210-753 m). The two species require critical comparison when additional specimens are collected. This is the first record of the species from New Caledonia.

Laemonema palauense Okamura, 1982

Fig. 5

Laemonema palauense Okamura, 1982: 137, pl. 83 (original description, Kyushu-Palau Ridge, Pacific Ocean).

Laemonema palauense: RIVATON *et al.*, 1989: 52 (listed).

MATERIAL EXAMINED. — 8 specimens, 77.6-276.0 mm SL.

New Caledonia. BIOCAL, stn CP 84, 20°43.49'S, 167°00.27'E (north of Lifou Island), 150-210 m depth, beam trawl, R. V. "Jean Charcot", 6 September 1985: 1 specimen (MNHN 1995-1006)*.

MUSORSTOM 4: stn CP 172, 19°01.20'S, 163°16.00'E (off Belep Islands, north of New Caledonia), 275-330 m depth, beam trawl, R. V. "Vauban", 17 September 1995: 1 specimen (MNHN 1995-1007)*. — Stn CP 238, 22°13.00'S, 167°14.00'E (off Grande Terre, southeast New Caledonia), 500-510 m depth, beam trawl, 2 October 1985: 1 specimen (MNHN 1995-1008)*.

Norfolk Ridge. SMIB 3: stn CP 4, 24°54.00'S, 168°21.5'E (seamount "B"), 530 m depth, beam trawl, R. V. "Vauban", 20 May 1987: 1 specimen (MNHN 1995-1009)*. — Stn DW 7, 24°54.6'S, 168°21.3'E (seamount "B"), 505 m depth, Waren dredge, 21 May 1987: 1 specimen (MNHN 1995-1010)*.

BERYX 3: stn 9, 24°43.29'S, 170°07.52'E (seamount "K"), 719-753 m depth, bottom longline, R. V. "Alis", 5 December 1991: 1 specimen (MNHN 1995-1011)*.

BERYX 11: stn 8, 24°52.6'S, 168°21.6'E (seamount "B"), 540-570 m depth, beam trawl, R. V. "Alis", 5 October 1992: 2 specimens (NMNZ-P. 29057)*.

DIAGNOSIS. — A species of *Laemonema* with enlarged teeth in outer series of both jaws; snout naked dorsally; two dorsal fins joined by membrane at base, second dorsal ray slightly prolonged; pelvic fins reaching beyond anus; 61-65 second dorsal fin rays.

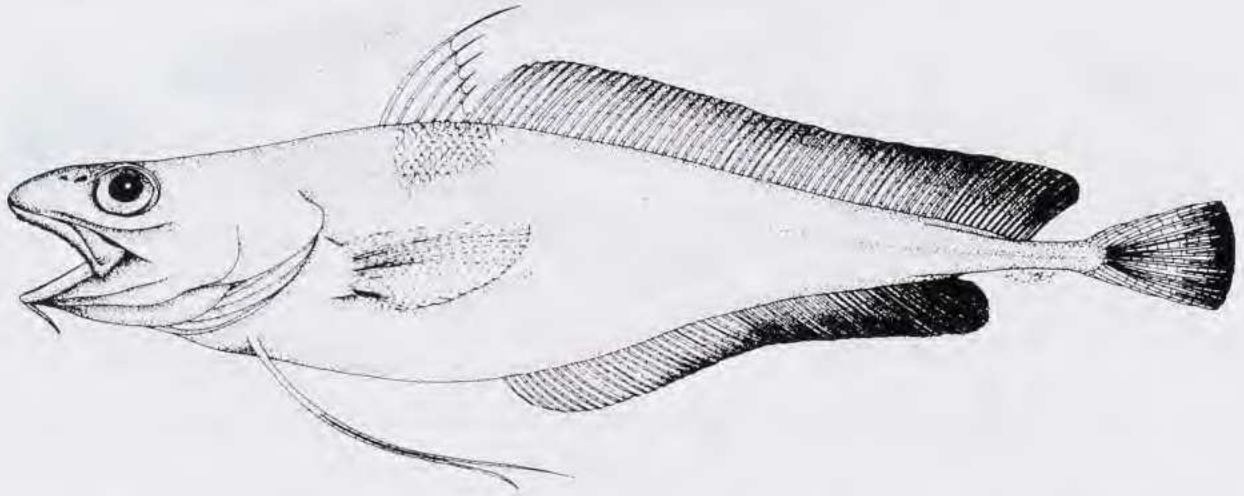


FIG. 5. — *Laemonema palauense* Okamura, 1982, specimen of 267 mm SL (MNHN 1995-1011), seamount "K", southeast of New Caledonia, 719-753 m depth, BERYX 3, stn 9.

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly shorter than diameter of eye. Barbel present on chin. Teeth villiform, in bands on jaws, a small rounded patch on vomer. First dorsal fin origin behind pectoral insertion, first ray minute, second longest, about half length of head. Second dorsal commences immediately behind first, height more or less uniform throughout its length. Anal fin commences immediately behind anus, height depressed along middle of its length. Caudal fin slightly rounded. Pelvic fins reduced to two long rays, reaching to beyond level of anus.

Measurements (in mm, % SL in parenthesis). Standard length 77.6-267.0; head length 18.6-68.4 (23.9-25.6), width 9.7-39.1 (12.5-14.6); body depth 13.4-68.2 (17.2-25.5); caudal peduncle depth 2.0-6.5 (1.8-2.4); orbit diameter 4.7-17.6 (5.6-6.5); interorbital width 3.2-9.1 (3.9-4.1); snout length 5.7-14.5 (6.3-7.2); maxilla length 9.1-32.3 (10.9-14.1); length of pectoral fin 15.7-46.5 (17.7-20.3); length of pelvic fin 20.5-57.6 (23.4-26.4); length of longest ray of first dorsal 6.1-41.4 (7.8-18.1), second 6.0-22.8 (7.7-10.0); length of longest ray of anal fin 5.1-17.6 (6.5-7.7); predorsal length 22.2-67.8 (26.7-29.7); preanal length 29.5-110.0 (38.0-48.2).

Meristics. First dorsal fin rays 1 + 4-5; second dorsal fin rays 61-63; anal fin rays 59-63; pectoral fin rays 22-23; pelvic fin rays 2; oblique scale rows in longitudinal series ca. 115- ca. 118; gill rakers 4 + 16-18; vertebrae 52-53.

Coloration (from preserved specimens). Head and body uniform pale tan, abdomen faintly silvery; snout and remaining scale pockets brown. Vertical fins pale except for dark brown margin on dorsal, caudal and posterior two thirds of anal; paired fins colourless.

DISTRIBUTION. — *Laemonema palauense* is known from the western Pacific Ocean from two disjunct, anti-equatorial, populations on the Kyushu-Palau Ridge (OKAMURA, 1982) and off New Caledonia (RIVATON *et al.*, 1989; this study) at 210-753 m depth.

REMARKS. — See *Laemonema filodorsale*.

Genus *LEPIDION* Swainson, 1838

Lepidion Swainson, 1838: 318 (neuter, type species *Gadus lepidion* Risso by monotypy).

DIAGNOSIS. — Morid fishes with blunt otoliths with a cup shaped expansion of the crista inferior (Fig. 1A); chin barbel present; longest ray of first dorsal fin enlarged, greater than length of head; anal fin deeply indented at mid-length; light organ absent.

REMARKS. — Nine poorly known species recognized, benthopelagic at 500-1,200 m depth in temperate and subtropical waters of all oceans (PAULIN, 1983; 1989a; COHEN *et al.*, 1990).

Lepidion inosimae (Günther, 1887)

Fig. 6

Haloporphyrus inosimae Günther, 1887: 92, fig. 92 (original description, Inosimae, Japan).

Lepidion inosimae: PAULIN, 1989: 59 (synonymy, description). — PAXTON & HANLEY, 1989: 300 (synonymy, first Australian record).

MATERIAL EXAMINED. — 2 specimens, 425.0-605.0 mm SL.

Norfolk Ridge. Stn 21-2, 24°44'S, 170°06.0'E, 805 m depth, bottom longline, F. V. "Humboldt", 11 June 1991: 1 specimen, 605.0 mm SL (MNHN 1995-1012).

BERYX 3: stn 8, 24°44.5'S, 170°08.8'E (seamount "K", southeast of New Caledonia), 797-800 m depth, bottom longline, R. V. "Alis", 4 December 1991: 1 specimen, 425 mm SL (MNHN 1995-1013).

DIAGNOSIS. — A species of *Lepidion* with more than 200 oblique scale rows in longitudinal series, and teeth on vomer in a rounded patch.

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly longer than diameter of eye. Barbel present on chin. Teeth villiform, a rounded patch on vomer. First dorsal fin origin behind pectoral insertion, first ray minute, second longest, greater than length of head. Second dorsal commences immediately behind first, height more or less uniform throughout its length. Anal fin commences immediately behind anus, height depressed along middle of its length. Caudal fin truncated. Pelvic fins not reaching anus.

Measurements (in mm, % SL in parenthesis). Standard length 425.0-605.0; head length 108.5-158.4 (25.5-26.1), width 61.2-93.1 (14.4-15.3); body depth 85.0-148.5 (20.0-24.5); caudal peduncle depth 12.0-19.5 (2.8-3.2); orbit diameter 22.1-28.4 (4.6-5.2); interorbital width 17.6-34.5 (4.1-5.7); snout length 30.5-47.6 (7.1-7.8); maxilla length 51.5-74.1 (12.1-12.2); length of pectoral fin 63.0-88.0 (14.5-14.8); length of pelvic fin broken- 155.0 (25.6);

length of longest ray of first dorsal 205.0-240.0 (39.6-48.2), second 38.5-51.0 (8.4-9.0); length of longest ray of anal fin 37.5-54.0 (8.8-8.9); predorsal length 107.5-134.0 (22.1-25.2); preanal length 200.0-300.0 (47.0-49.5).

Meristics. First dorsal fin rays 1 + 5; second dorsal fin rays 55-58; anal fin rays 49-52; pectoral fin rays 21; pelvic fin rays 7; oblique scale rows in longitudinal series ca. 201-208; gill rakers 3-4 + 8-11; vertebrae 56-58.

Coloration (from preserved specimens). Head and body greyish, slightly paler ventrally; vertical fins dark distally; tip of snout, lips and branchiostegal membranes black.

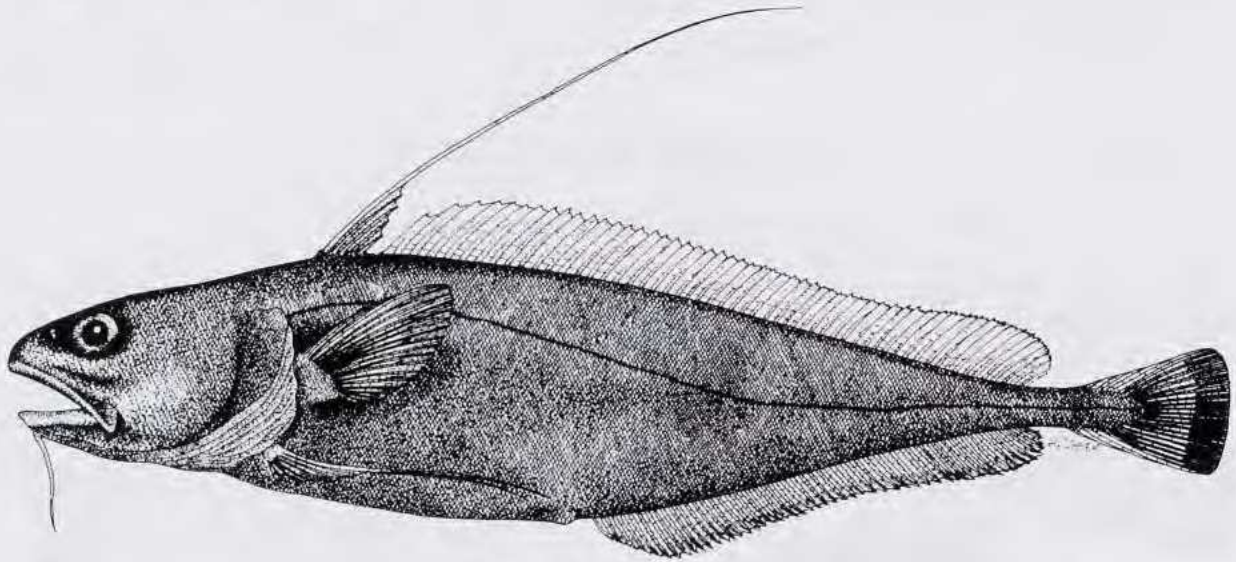


FIG. 6. — *Lepidion inosimae* (Günther, 1887), specimen of 605 mm SL (MNHN 1995-1012), seamount "K", southeast of New Caledonia, 805 m depth, F.V. "HUMBOLDT", 1991, stn 21-2.

DISTRIBUTION. — *Lepidion inosimae* has an anti-equatorial distribution in the west Pacific Ocean. It has been recorded from the northwest Pacific in Sagami Bay, Japan, at the Ramapo Bank south of Japan, and on the Emperor Seamounts (NAKAYA *et al.*, 1980). In the southwest Pacific it is known in southeast Australian waters (PAXTON & HANLEY, 1989), New Zealand waters north of the Chatham Rise (PAULIN, 1984; 1990) and off New Caledonia (the present study).

REMARKS. — With the exception of *L. schmidti*, the very small scales distinguish this species from other species of the genus in the Indo-Pacific region. *Lepidion inosimae* can be distinguished from *L. schmidti* by a rounded (vs triangular) patch of villiform teeth on the vomer. This is the first record of the species from New Caledonia. *Lepidion inosimae* can exceed 2 m in length and is the largest species in the family (PAULIN, 1989a).

Genus *MORA* Risso, 1826

Mora Risso, 1826: 224 (feminine, type species *Mora mediterranea* Risso by monotypy).

DIAGNOSIS. — Morid fishes with blunt otoliths with a cup shaped expansion of the crista inferior and a greatly expanded anterior end; anal fin greatly depressed along the middle of its length and often divided into two fins (PAULIN, 1983).

REMARKS. — A monotypic genus with a single widespread species recognized.

Mora moro (Risso, 1810)

Fig. 7

Gadus moro Risso, 1810: 116 (original description, Mediterranean Sea).*Mora pacifica* Waite, 1914: 128 (original description, Kaikoura, New Zealand).*Mora dannevigii* Whitley, 1948: 82 (original description, Great Australian Bight).*Mora moro*: PAULIN, 1983: 112 (synonymy, description, fig.). — PAXTON & HANLEY, 1989: 301 (synonymy).

MATERIAL EXAMINED. — 2 specimens, 370-520 mm SL.

Norfolk Ridge. BERYX 3: stn 9, 24°43.3'S, 170°07.5'E (seamount "K", southeast of New Caledonia), 719-753 m depth, bottom longline, R. V. "Alis", 5 December 1991: 1 specimen, 370 mm SL (MNHN 1995-1014).

BERYX 5: stn 1, 24°54.3'S, 168°21.1'E (seamount "B", southeast of New Caledonia), 597-625 m depth, bottom longline, R. V. "Alis", 29 January 1992: 1 specimen, 520 mm SL (MNHN 1995-1015)*.

DIAGNOSIS. — As for genus.

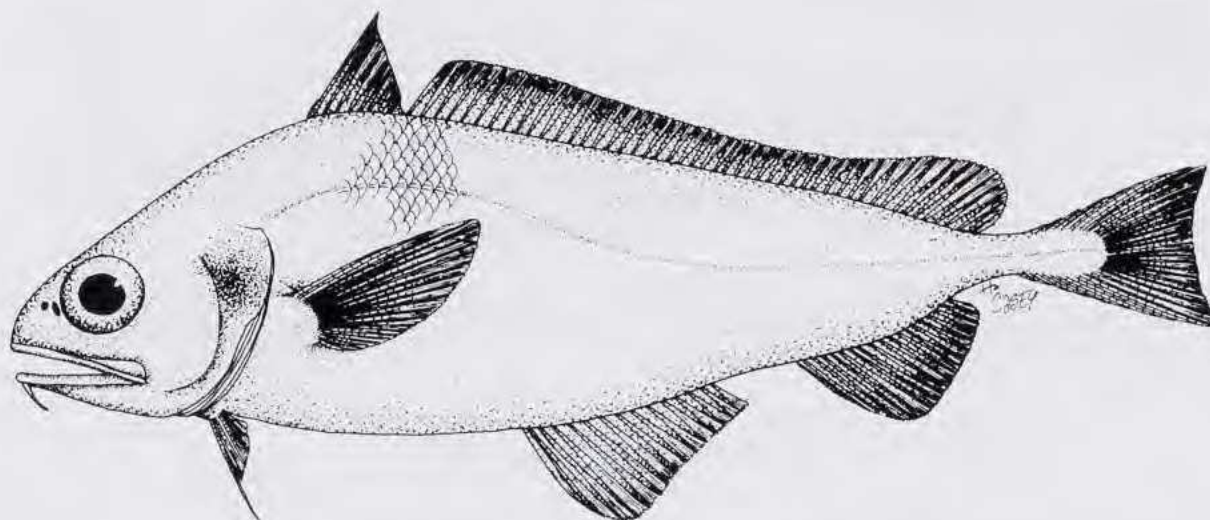


FIG. 7. — *Mora moro* (Risso, 1810), specimen of 520 mm SL (MNHN 1995-1015), seamount "B", southeast of New Caledonia, 597-625 m depth, BERYX 5, stn 1.

DESCRIPTION. — Body elongate, rounded, slightly compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, shorter than diameter of eye. A small barbel present on chin. Teeth villiform, a rounded patch on vomer. First dorsal fin origin behind pectoral insertion, first ray minute, second longest, less than length of head. Second dorsal commences immediately behind first, height more or less uniform throughout its length. Anal fin commences immediately behind anus, height depressed along middle of its length and often divided into two separate fins. Caudal fin truncated. Pelvic fins not reaching anus.

Measurements (in mm, % SL in parenthesis). Standard length 370.0-520.0; head length 92.5-131.5 (25.0-25.2), width 60.0-86.9 (16.2-16.7); body depth 101.0-145.0 (27.2-27.8); caudal peduncle depth 11.1-24.0 (3.0-4.6); orbit diameter 37.5-44.6 (10.1-8.5); interorbital width 17.9-27.5 (4.8-5.2); snout length 21.3-31.8 (5.7-6.1); maxilla length 46.7-67.0 (12.6-13.4); length of pectoral fin 68.5-94.4 (18.5-18.1); length of pelvic fin 58.2-49.0 (15.7-9.4); length of longest ray of first dorsal 45.1-59.3 (12.1-11.4), second 32.1-43.1 (8.6-8.2); length of longest ray of first anal fin 43.0-55.5 (11.6-10.6), second 41.2-43.7 (11.1-8.4); predorsal length 114.6-180.0 (30.9-34.6); preanal length 188.0-256.0 (50.8-49.2).

Meristics. First dorsal fin rays 1 + 8; second dorsal fin rays 49-51; first anal fin rays 15-16; second anal fin rays 19; caudal fin with 8-9 dorsal procurrent rays, 19-20 branched rays, and 10-12 ventral procurrent rays; pectoral fin rays 21; scale rows in transverse series 6-7 + (1) + 18-17; vertebrae 51.

Coloration (from preserved specimens). Head and body pale grey with darker flecks on edges of scale pockets. Fins with pale brown membranes. Buccal cavity pale, branchial cavity black.

DISTRIBUTION. — *Mora moro* is widely distributed in temperate and subtropical waters outside the South Atlantic and North Pacific Oceans; it is known from the Mediterranean Sea, Northwest Atlantic Ocean, Southern Indian Ocean south of Madagascar, the South Pacific Ocean off Australia, New Caledonia, New Zealand and off Chile (PAULIN, 1983; PAXTON & HANLEY, 1989; COHEN *et al.*, 1990; this study).

REMARKS. — *Mora moro* has previously been recorded in the South Pacific Ocean as *M. pacifica* Waite (New Zealand and Chile) and *M. dannevigii* Whitley (Australia), but these have been shown to be synonyms of *Mora moro* by PAULIN (1983). This is the first record of the species from New Caledonia, and is the most northern locality known in the Southern Hemisphere.

Genus *PHYSICULUS* Kaup, 1858

Physiculus Kaup, 1858: 88 (masculine, type species *Physiculus dalwigki* Kaup by monotypy).

DIAGNOSIS. — Morid fishes with pointed, spindle shaped otoliths (Fig. 1D); anus in advance of anal fin origin; a ventral light organ placed between pelvic fin insertions and anus.

REMARKS. — The most speciose morid genus with over 31 species recognized; found in tropical and warm temperate waters of all oceans, many species confined to seamounts, submarine ridges or island chains in the Pacific region (PAULIN, 1989b; COHEN *et al.*, 1990: 351).

Physiculus longifilis Weber, 1913

Fig. 8

Physiculus longifilis Weber, 1913: 58 (original description, Flores Sea, Indonesia).

MATERIAL EXAMINED. — 1 specimen, 76.1 mm SL.

New Caledonia. BATHUS 1: stn 711, 21°43.00'S, 166°35.71'E (off central east New Caledonia), 320 m depth, R. V. "Alis", 19 March 1993: 1 specimen, 76.1 mm SL (MNHN 1995-1016)*.

DIAGNOSIS. — A species of *Physiculus* with a moderately small light organ placed slightly closer to anus than level of pelvic fin insertion, distance between rear margin of light organ and anus slightly more than diameter of light organ (Fig. 8B); ventral fins long, reaching to mid point of anal fin (PAULIN, 1989b).

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly shorter than diameter of eye. Barbel present on chin. Teeth villiform, equal sized, vomer without teeth. First dorsal fin origin behind pectoral insertion, first ray minute, third or fourth ray longest but only slightly longer than other rays. Second dorsal commences immediately behind first, height less than that of first dorsal and more or less uniform throughout its length. Anal fin commences a short distance behind anus, height only slightly depressed along middle of its length. Caudal fin truncated to slightly rounded. Pelvics reaching to midpoint of anal fin. Ventral light organ moderately small, in advance of anus and placed closer to anus than level of pelvic fin insertions.

Measurements (in mm, % SL in parenthesis). Standard length 76.1; head length 21.5 (28.2), width 12.1 (15.9); body depth 14.5 (19.0); caudal peduncle depth 2.2 (2.8); orbit diameter 3.8 (4.9); interorbital width 5.5 (7.2); snout length 5.6 (7.3); maxilla length 10.0 (13.1); length of pectoral fin 12.0 (15.7); length of pelvic fin 40.1 (52.6); length of longest ray of first dorsal 7.2 (9.4), second 4.5 (5.9); predorsal length 21.5 (27.8); preanal length 27.6 (36.2); diameter of light organ 0.9 (0.06); distance from light organ to interpelvic line 9.5 (6.3).

Meristics. First dorsal fin rays 1 + 6; second dorsal fin rays 59; anal fin rays 63; pectoral fin rays 24; pelvic fin rays 6; oblique scale rows in longitudinal series ca. 75; scales between origin of first dorsal fin and lateral line 6; gill rakers 3 + 9; vertebrae 51.

Coloration (from preserved specimen). Head and body pale pinkish tan, abdomen bluish. Branchiostegal membranes, snout, orbit rim and remaining scale pockets brown. Vertical fins dusky near tips, axil of pectoral fin dark brown. Light organ and anus black.

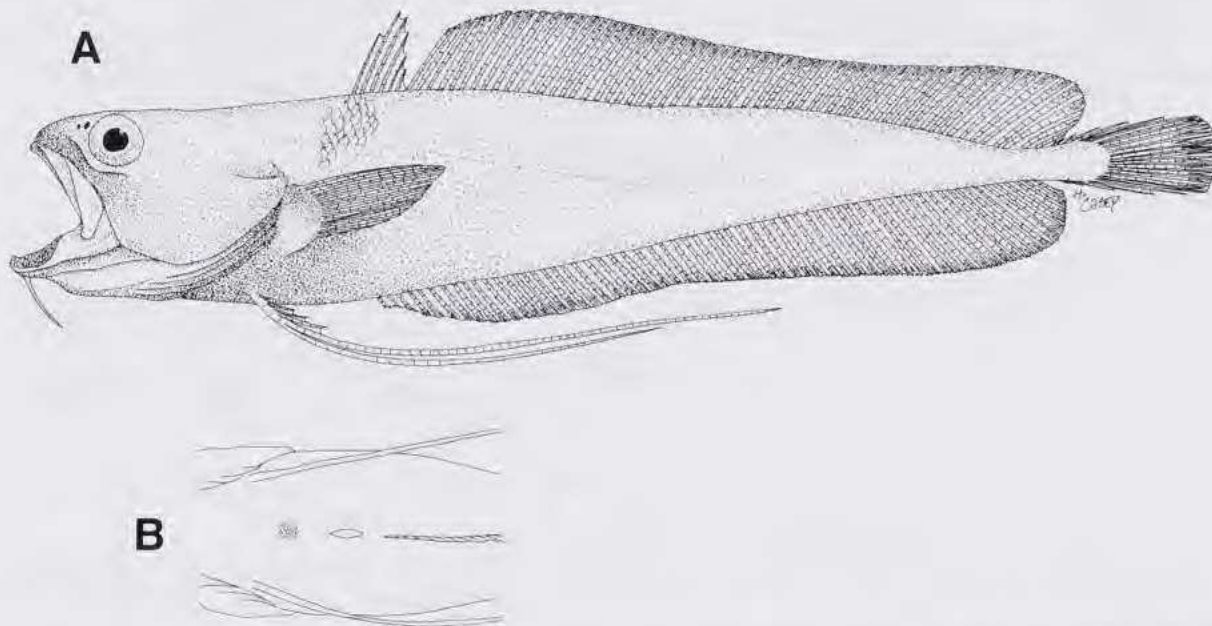


FIG. 8. — *Physiculus longifilis* Weber, 1913, specimen of 76.1 mm SL (MNHN 1995-1016), off central east coast, New Caledonia, 320 m depth, BATHUS, stn 711. — A: whole fish in left lateral view. — B: ventral view of light organ.

DISTRIBUTION. — *Physiculus longifilis* is known from Indonesia and northern Australia at 250 m depth (PAULIN, 1989b); it is now also known from off New Caledonia (this study).

REMARKS. — This study extends the known range of *P. longifilis* in the western Pacific Ocean into New Caledonian waters; it is expected that the species will occur on other slope areas and possibly seamounts in the area.

Physiculus luminosus Paulin, 1983

Fig. 9

Physiculus luminosa Paulin, 1983: 96, fig. 11 (original description, between Alderman & Red Mercury Islands, New Zealand).

Physiculus luminosa: PAULIN, 1989b: 115, fig. 14 (description, distribution). — PAXTON & HANLEY, 1989: 301 (synonymy, distribution).

MATERIAL EXAMINED. — 1 specimen, 176 mm SL.

New Caledonia, 20°50.0'S, 165°15.0'E (Grande Passe Touho, east coast of Grande Terre), 400-440 m depth, F. V. "Dar Mad", 17 March 1986: 1 specimen, 176 mm SL (MNHN 1995-1017)*.

DIAGNOSIS. — A species of *Physiculus* with a large light organ placed adjacent to the level of pelvic fin insertion, distance between rear margin of light organ and anus approximately equal to twice diameter of light organ (Fig. 9B); 11-16 scales between origin of first dorsal fin and lateral line (PAULIN, 1989b).

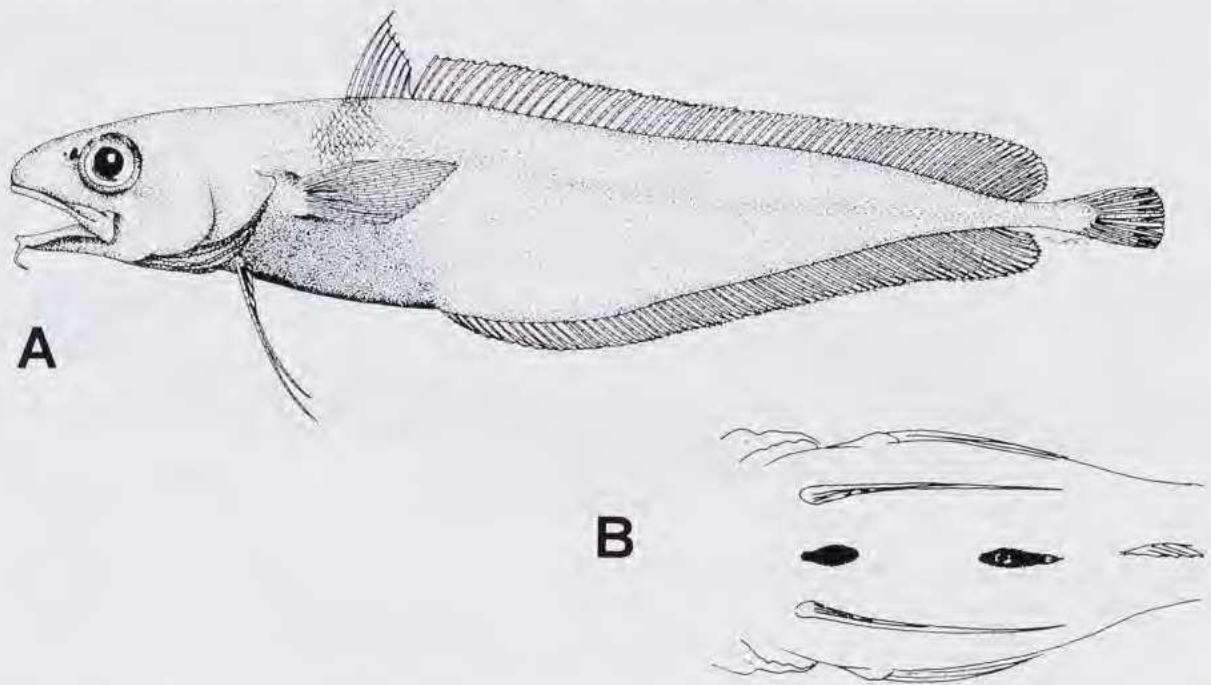


FIG. 9. — *Physiculus luminosus* Paulin, 1983, specimen of 176 mm SL (MNHN 1995-1017), Grande Passe Touho, New Caledonia, 400-440 m depth, F. V. "Dar Mad", 1986. — **A**: whole fish in left lateral view. — **B**: ventral view of light organ.

DESCRIPTION. — Body elongate, compressed posteriorly; greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly shorter than diameter of eye. Barbel present on chin. Teeth villiform, equal sized, vomer without teeth. First dorsal fin origin behind pectoral insertion, first ray minute, third or fourth ray longest but only slightly longer than other rays. Second dorsal commences immediately behind first, height less than that of first dorsal and more or less uniform throughout its length. Anal fin commences a short distance behind anus, height only slightly depressed along middle of its length. Caudal fin truncated to slightly rounded. Pelvics reaching to midway between anus and anal fin. Ventral light organ large, well in advance of anus and placed close to level of pelvic fin insertions.

Measurements (in mm, % SL in parenthesis). Standard length 176.0; head length 46.9 (26.6), width 34.0 (19.3); body depth 31.8 (18.0); caudal peduncle depth 4.4 (2.5); orbit diameter 10.6 (6.0); interorbital width 10.4 (5.9); snout length 13.5 (7.6); maxilla length 22.9 (13.0); length of pectoral fin 29.1 (16.5); length of pelvic fin 25.2 (14.3); length of longest ray of first dorsal 21.4 (12.1), second 16.6 (9.4); length of longest ray of anal fin 14.7 (8.3); predorsal length 54.1 (30.7); preanal length 72.0 (40.9); diameter of light organ 5.6 (3.1); distance from light organ to interpelvic line 1.1 (0.6).

Meristics. First dorsal fin rays 1 + 7; second dorsal fin rays 64; anal fin rays 68; pectoral fin rays 25; pelvic fin rays 6; oblique scale rows in longitudinal series ca. 115; scales between origin of first dorsal fin and lateral line 12; gill rakers 4 + 10; vertebrae 54.

Coloration (from preserved specimen). Head and body pale pinkish tan, abdomen bluish. Branchiostegal membranes, snout, orbit rim and remaining scale pockets brown. Vertical fins dusky near tips, axil of pectoral fin dark brown. Light organ and anus black.

DISTRIBUTION. — *Physiculus luminosus* is known from the South Pacific Ocean, and has been recorded off South America on the Nasca Ridge, in the central South Pacific on the Austral Ridge, and in the Southwest Pacific off northern New Zealand and eastern Australia (Queensland and New South Wales) at 130-640 m depth (PAULIN, 1989b; PAXTON & HANLEY, 1989); it is now also known from off New Caledonia (this study).

REMARKS. — This study extends the known range of *P. luminosus* in the western Pacific Ocean into New Caledonian waters. *Physiculus luminosus* inhabits shelf and slope areas off Australia and New Zealand, within the New Caledonian EEZ it has only been collected on the slope of the main island of New Caledonia. Further survey work is required to help establish whether the species is confined to the main island slope or extends on to offshore seamounts where its congener, *P. therosideros*, is particularly common (see below).

Physiculus roseus Alcock, 1891

Fig. 10

Physiculus roseus Alcock, 1891: 18 (original description, Andaman sea).

Physiculus roseus: PAULIN, 1989b: 123 (description, distribution). — PAXTON & HANLEY, 1989: 302 (synonymy, distribution).

MATERIAL EXAMINED. — 2 specimens, 83.8-85.0 mm SL.

New Caledonia. BATHUS 1: stn 657, 21°14.45'S, 165°54.93'E (off central west coast of Grande Terre), 510 m depth, beam trawl, R. V. "Alis", 12 March 1993: 2 specimens, 83.8-85.0 mm SL (MNHN 1995-1018)*.

DIAGNOSIS. — A species of *Physiculus* with a moderately large light organ placed slightly closer to the level of pelvic fin insertion than anus, distance between rear margin of light organ and anus slightly more than one and a half times diameter of light organ (Fig. 10B); 90-95 scale rows in longitudinal series; 8 scales between origin of first dorsal fin and lateral line; 46-49 vertebrae (PAULIN, 1989b).

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, about equal to diameter of eye. Barbel present on chin. Teeth villiform, equal sized, vomer without teeth. First dorsal fin origin behind pectoral insertion, first ray minute, third or fourth ray longest but only slightly longer than other rays. Second dorsal commences immediately behind first, height less than that of first dorsal and more or less uniform throughout its length. Anal fin commences a short distance behind anus, height only slightly depressed along middle of its length. Caudal fin truncated to slightly rounded. Pelvics reaching to about sixth ray of anal fin. Ventral light organ large, and placed slightly closer to level of pelvic fin insertions than anus.

Measurements (in mm, % SL in parenthesis). Standard length 83.8-85.0; head length 22.6-22.8 (26.5-27.2), width 11.3 (13.4); body depth 11.0-13.3 (12.9-15.8); caudal peduncle depth 1.6-1.9 (1.9-2.2); orbit diameter 5.2-5.6 (6.2-6.5); interorbital width 4.5-4.6 (5.3-5.4); snout length 5.5-6.1 (6.5-7.1); maxilla length 9.7-10.6 (11.4-12.6); length of pectoral fin 12.0-14.4 (14.3-16.9); length of pelvic fin 10.8-13.5 (12.1-12.7); length of longest ray of first dorsal 10.2-10.8 (12.1-12.7), second 7.1-7.5 (8.4-8.8); predorsal length 24.0-24.2 (28.4-28.6); preanal length 30.0-30.6 (35.7-36.0); diameter of light organ 1.2-1.4 (1.4-1.6); distance from light organ to interpelvic line 10.6-11.6 (11.6-12.6).

Meristics. First dorsal fin rays 1 + 8-9; second dorsal fin rays 59-65; anal fin rays 66-67; pectoral fin rays 24-25; pelvic fin rays 6; oblique scale rows in longitudinal series ca. 90-93; scales between origin of first dorsal fin and lateral line 8; gill rakers 3 + 10-11; vertebrae 47-48.

Coloration (from preserved specimen). Head and body pale pinkish tan, abdomen bluish. Branchiostegal membranes, snout, orbit rim and remaining scale pockets brown. Vertical fins dusky near tips, axil of pectoral fin dark brown. Light organ and anus black.

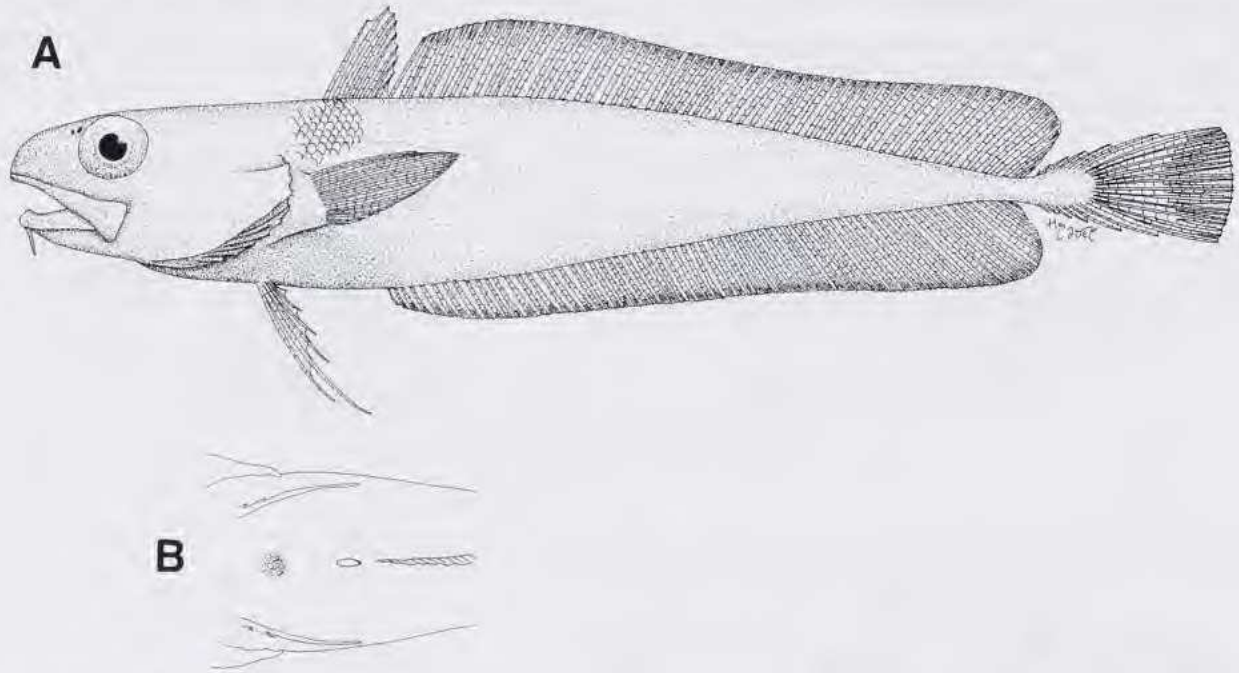


FIG. 10. — *Physiculus roseus* Alcock, 1891, specimen of 83.8 mm SL (MNHN 1995-1018), off central east coast, New Caledonia, 510 m depth, BATHUS 1, stn 657. — **A**: whole fish in left lateral view. — **B**: ventral view of light organ.

DISTRIBUTION. — *Physiculus roseus* is known from throughout the Indo-Pacific region, from the Bay of Bengal in the eastern Indian Ocean to western Australia, Indonesia, Papua New Guinea and the south China Sea, at 300-510 m depth (PAULIN, 1989b; PAXTON & HANLEY, 1989); it is now also known from off New Caledonia (this study).

REMARKS. — This study extends the known range of *P. roseus* into New Caledonian waters; it is the most easterly record for the species and the first record for New Caledonia.

Physiculus therosideros Paulin, 1987

Fig. 11, Table 2

Physiculus therosideros Paulin, 1987: 76 (original description, New South Wales, Australia).

Physiculus therosideros: PAULIN, 1989b: 126, figs 13-14 (description, distribution).

MATERIAL EXAMINED. — 112 specimens, 100.5-168.0 mm SL.

New Caledonia. BIOCAL: stn CP 67, 24°55.44'S, 168°21.55'E (seamount "B"), 500 m depth, beam trawl, R. V. "Jean Charcot", 3 September 1985: 11 specimens (MNHN 1995-1019)*. — Stn CP 108, 22°02.55'S, 167°05.68'E (off Yate, Grande Terre), 335 m depth, beam trawl, 9 September 1985: 1 specimen (MNHN 1995-1020)*.

MUSORSTOM 4: stn CP 213, 22°51.30'S, 167°12.00'E (southern slope of Grande Terre), 405-430 m depth, beam trawl, R. V. "Vauban", 28 September 1985: 2 specimens (MNHN 1995-1021)*. — Stn CP 214, 22°53.80'S, 167°13.90'E (southern slope of Grande Terre), 425-440 m depth, beam trawl, 28 September 1985: 1 specimen (MNHN 1995-1022)*. — Stn CP 215,

22°55.70'S, 167°17.00'E (southern slope of Grande Terre), 485-520 m depth, beam trawl, 28 September 1985: 5 specimens (MNHN 1995-1023)*. — stn CP 216, 22°59.50'S, 167°22.00'E (southern slope of Grande Terre), 490-510 m depth, beam trawl, 29 September 1985: 5 specimens (MNHN 1995-1024)*.

Chesterfield and Bellona Plateaus. MUSORSTOM 5: stn CP 312, 22°17.20'S, 159°24.80'E (off Bellona Reefs, Bellona Plateau), 315-320 m depth, beam trawl, R. V. "Coriolis", 12 October 1986: 1 specimen (MNHN 1995-1025)*.

Norfolk Ridge. CHALCAL 2: stn CC 2, 24°55.48'S, 168°21.29'E (seamount "B"), 500-610 m depth, otter trawl, R. V. "Coriolis", 28 October 1986: 14 specimens (MNHN 1995-1026)*. — Stn CP 25, 23°38.60'S, 167°43.12'E (Stylaster seamount), 418 m depth, 30 October 1986: 6 specimens (MNHN 1995-1027)*.

SMIB 3: stn CP 4, 24°54.00'S, 168°21.50'E (seamount "B"), 530 m depth, beam trawl, R. V. "Vauban", 20 May 1987: 9 specimens (MNHN 1995-1028).

SMIB 4: stn DW 34, 24°55.00'S, 168°22.00'E (seamount "B"), 515 m depth, Waren dredge, R. V. "Alis", 7 March 1989: 2 specimens (MNHN 1995-1029)*. — Stn DW 36, 24°55.6'S, 168°27.7'E (seamount "B"), 530 m depth, Waren dredge, 7 March 1989: 1 specimen (MNHN 1995-1030)*. — Stn DW 58, 22°59.8'S, 167°24.2'E (Ile des Pins slope), 560 m depth, Waren dredge, 9 March 1989: 1 specimen (MNHN 1995-1031)*.

AZTEQUE: stn 1, 23°13.3'S, 168°04.6'E (Azteque seamount), 290-460 m depth, otter trawl, R. V. "Alis", 12 February 1990: 6 specimens (MNHN 1995-1032). — Stn 4, 23°42.5'S, 168°01.2'E (Jumeaux seamount), 235-400 m depth, otter trawl, 13 February 1990: 4 specimens (MNHN 1995-1033). — Stn 7, 23°41.0'S, 167°45.8'E (Stylaster seamount), 425-500 m depth, otter trawl, 14 February 1990: 11 specimens (MNHN 1995-1034). — Stn 11, 22°54.8'S, 167°35.7'E (Ile des Pins shelf), 340-360 m depth, otter trawl, 15 February 1990: 2 specimens (MNHN 1995-1035).

BERYX 2: stn 4, 24°56.6'S, 168°21.8'E (seamount "B"), 580-590 m depth, otter trawl, R. V. "Alis", 24 October 1991: 1 specimen (NMNZ-P.27444)*. — Stn 5, 24°56.6'S, 168°21.1'E (seamount "B"), 522-575 m depth, bottom trawl, 24 October 1991: 2 specimens (NMNZ-P.27453)*, and 3 specimens (NMNZ-P.27454)*.

BERYX 11: stn CP 8, 24°52.50'S, 168°21.60'E (Seamount "B"), 540-570 m depth, beam trawl, R. V. "Alis", 15 October 1992: 24 specimens (NMNZ-P.29056)*.

DIAGNOSIS. — A species of *Physiculus* with a large ventral light organ placed well behind the pelvic fin insertions, distance between rear margin of light organ and anus approximately equal to diameter of light organ (Fig. 11B); 8-11 scales between origin of first dorsal fin and lateral line.

DESCRIPTION. — Body elongate, compressed posteriorly, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly shorter than diameter of eye. Barbel present on chin. Teeth villiform, those in the outer series slightly larger, none on vomer. First dorsal fin origin behind pectoral insertion, first ray minute, third or fourth ray longest, but not greatly exceeding length of other rays. Second dorsal commences immediately behind first, height more or less equal to first and uniform throughout its length. Anal fin commences a short distance behind anus, height only slightly depressed along middle of its length. Caudal fin truncated. Pelvics reaching well beyond anus to about third anal fin ray. Ventral light organ large, placed a short distance behind level of pelvic fin insertions.

Measurements (in mm, % SL in parenthesis). Standard length 100.5-168.0; head length 27.3-42.5 (23.9-27.1), width 17.0-27.7 (13.2-17.9); body depth 16.5-28.0 (16.4-18.0); caudal peduncle depth 2.5-4.1 (1.8-2.6); orbit diameter 7.4-9.4 (5.9-7.3); interorbital width 5.8-10.1 (4.6-6.4); snout length 7.6-12.3 (7.1-7.8); maxilla length 13.2-20.9 (10.5-13.3); length of pectoral fin 14.8-23.2 (13.7-14.7); length of pelvic fin 17.3-25.2 (15.1-17.2); length of longest ray of first dorsal 6.9-11.6 (6.8-7.5), second dorsal 6.7-11.1 (6.6-7.5); length of longest ray of anal fin 6.5-11.0 (6.4-7.0); predorsal length 32.0-48.0 (25.9-31.8); preanal length 38.5-58.5 (37.3-38.3); diameter of light organ 2.1-3.2 (2.0-2.2); distance from light organ to interpelvic line 2.5-4.0 (2.3-2.5).

Meristics. Frequency distributions of counts of dorsal fin rays, anal fin rays and vertebrae are given in Table 2. First dorsal fin rays 1 + 5-7; second dorsal fin rays 63-73; anal fin rays 66-74; pectoral fin rays 22-25; pelvic fin rays 5-6; oblique scale rows in longitudinal series ca. 125-128; scales between origin of first dorsal fin and lateral line 8-11; gill rakers 2-3 + 7-8; vertebrae 53-56.

Coloration (from fresh and frozen specimens). Head pinkish, top of head and snout brown; body pinkish, silvery on sides and pectoral base, scale pockets brown dorsally, abdomen pale grey-blue; light organ black; dorsal, anal and caudal fins pinkish red, with fine black margins; pectoral fin bright reddish pink, its base dark brownish black; ventral fins pink, with a black insertion; light organ black.

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TABLE 2. — Frequency distributions of counts of selected fin rays and vertebrae of *Physiculus therosideros* Paulin, 1987, from New Caledonia (total n = 52-56).

	First			Second												
Dorsal fin	6	7	8	61	62	63	64	65	66	67	68	69	70	71	72	73
	9	39	8	1	0	1	4	9	7	9	6	7	1	5	3	1
Anal fin	63	64	65	66	67	68	69	70	71	72	73	74				
	1	1	0	1	3	4	12	9	6	3	6	7				
Vertebrae	52	53	54	55	56											
	6	12	16	16	2											

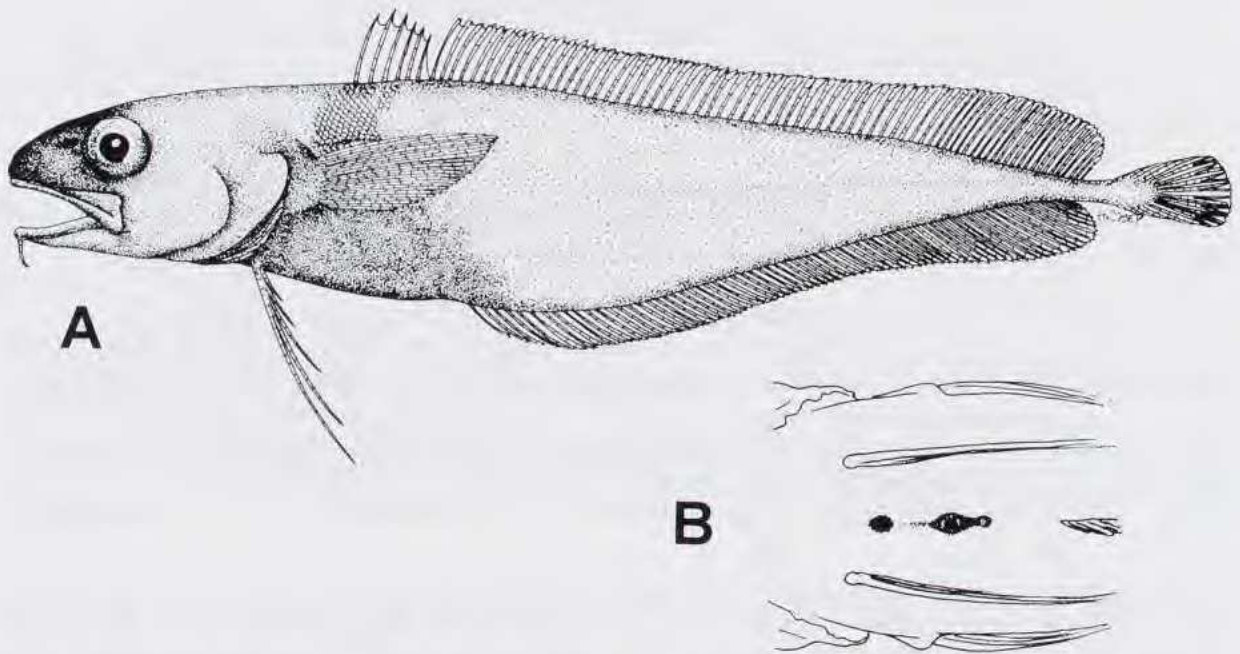


FIG. 11. — *Physiculus therosideros* Paulin, 1987, specimen of 152 mm SL (NMNZ-P.27453), seamount "B", southeast of New Caledonia, 580-590 m depth, BERYX 2, stn 4. — A: whole fish in left lateral view. — B: ventral view of light organ.

Coloration (from preserved specimens). Head and body pale tan, abdomen bluish. Branchiostegal membranes, snout, orbit rim and remaining scale pockets brown. Vertical fins with a black margin, insertion of pectoral fin dark brown. Light organ and anus black.

DISTRIBUTION. — *Physiculus therosideros* occurs in deep subtropical waters of the southwest Pacific Ocean. It is known from off Queensland and New South Wales (Australia), Bellona Plateau, on Norfolk Ridge seamounts and the Ile des Pins region southeast of New Caledonia, and off the Kermadec Islands north of New Zealand, at 83-610 m depth (PAULIN, 1987; 1989b; this study).

REMARKS. — *Physiculus therosideros* was previously known only from eight specimens collected off Australia and the Kermadec Islands, and one specimen from New Caledonia (PAULIN, 1989b). The number of preserved specimens examined in this study ($n = 112$) and the large numbers of fresh specimens observed in catches during the BERYX 11 stations (specimens present in 17 out of 60 stations, with beam trawls containing up to 35 specimens, pers. obs.) indicate that this species is particularly common on seamounts south of New Caledonia. The number of specimens examined enable a greater range of meristic variation to be described than previously recorded, particularly in second dorsal and anal fin ray counts (Table 1): D_2 61-73, A 63-74 (cf. D_2 60-63, A 62-66 given by PAULIN, 1987; 1989b). The ranges of fin ray counts are now known to be similar to those of *P. luminosus* (D_2 62-71, A 64-79), however, the species can be distinguished by the position of the light organ and number of transverse scale rows.

RIVATON *et al.* (1989: 53) and GRANDPERRIN *et al.* (1990: 18) recorded *Physiculus peregrinus* (Günther) from New Caledonia, a species only known from the Philippines area (PAULIN, 1989b). Examination of voucher specimens collected during cruise AZTEQUE shows that this record is based on misidentifications of *P. therosideros*. *P. therosideros* can be readily distinguished from *P. peregrinus* by counts of scales between base of first dorsal fin and lateral line (11-14, vs 7-8) and gill rakers (2-3 + 7-8, vs 4 + 10-12).

Genus *TRIPTEROPHYCIS* Boulenger, 1902

Tripteroptychys Boulenger, 1902: 335 (feminine, type species *Tripteroptychys gilchristi* Boulenger by monotypy).

DIAGNOSIS. — Morid fishes with pointed, spindle shaped otoliths (Fig. 1E); chin barbel present; three dorsal fins (second dorsal divided into a high anterior portion and a low posterior portion); long-based anal fin; ventral light organ present.

REMARKS. — A genus of benthopelagic morids containing two species, widespread in temperate and subtropical waters of the Southern Hemisphere (COHEN *et al.*, 1989: 378; SAZONOV & PAKHORUKOV, 1992).

Tripteroptychys svetovidovi Sazonov & Shcherbachev, 1986

Fig. 12

Tripteroptychys svetovidovi Sazonov & Shcherbachev, 1986: 1099, fig. 1 (original description, Sala y Gomez Ridge, southeast Pacific Ocean).

Tripteroptychys sp.: RIVATON *et al.*, 1989: 53 (listed).

MATERIAL EXAMINED. — 8 specimens, 167.5-234.0 mm SL.

Norfolk Ridge. CHALCAL 2: stn CC 1, 24°54.96'S, 168°21.91'E (seamount "B"), 500-580 m depth, otter trawl, R. V. "Coriolis", 28 October 1986: 1 specimen, 196 mm SL (MNHN 1995-1036)*. — Stn CC 2, 24°25.48'S, 168°21.25'E (seamount "B"), 500-610 m depth, otter trawl, 28 October 1986: 1 specimen, 195 mm SL (MNHN 1995-1037)*.

SMIB 3: stn CP 4, 24°54.0'S, 168° 21.5'E (seamount "B"), 530 m depth, beam trawl, R. V. "Vauban", 20 May 1987: 1 specimen, 195 mm SL (MNHN 1995-1038). — Exact locality unknown (south of New Caledonia), beam trawl, May 1987: 1 specimen, 197 mm SL (MNHN 1995-1039).

BERYX 2: stn 4, 24°56.6'S, 168°21.8'E (seamount "B"), 580-583 m depth, otter trawl, R. V. "Alis", 24 October 1990: 2 specimens, 220-234 mm SL (NMNZ-P.27443)*.

New Caledonia. BIOCAL: stn CP 67, 24°55.44'S, 168°21.55'E (seamount "B"), 500 m depth, beam trawl, R. V. "Jean Charcot", 3 September 1985: 1 specimen, 167 mm SL (MNHN 1995-1040)*.

DIAGNOSIS. — A species of *Tripteroptychys* with conical teeth in lower jaw; 14-15 scales between origin of second dorsal fin and lateral line; 217-225 oblique scale rows in longitudinal series; snout length 25.2-32.0% head length.

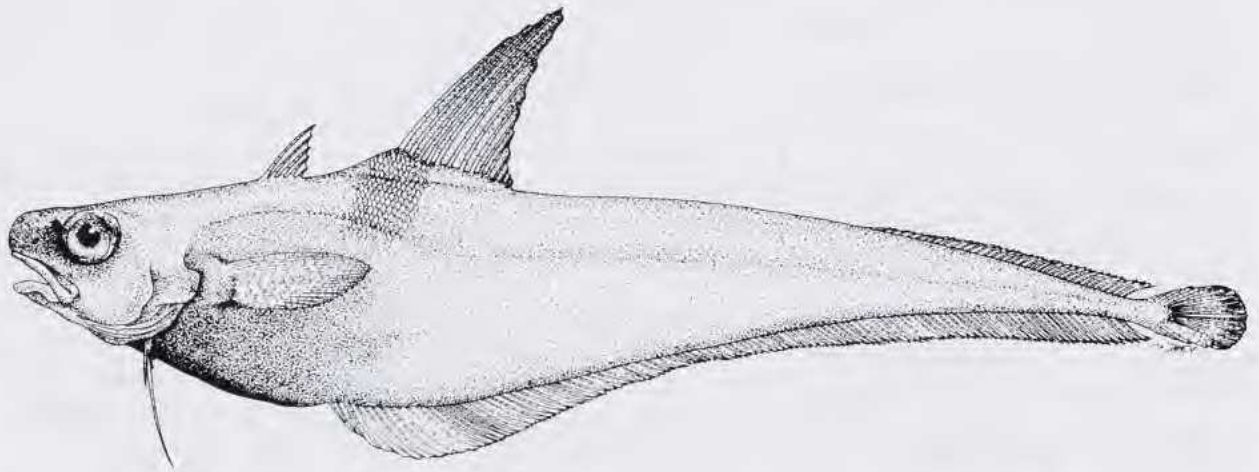


FIG. 12. — *Tripterophycis svetovidovi* Sazonov & Shcherbachev, 1986, specimen of 216 mm SL (NMNZ-P.27443), seamount "B", southeast of New Caledonia, 220-234 m depth, BERYX 2, stn 4.

DESCRIPTION. — Body elongate, compressed, greatest depth at origin of second dorsal fin. Snout broad, rounded, slightly shorter than diameter of eye. Interorbital width less than diameter of eye. Minute barbelle present on chin. Teeth small, conical, in a single irregular series. First dorsal fin origin above pectoral insertion, first ray minute, second longest. Second dorsal commences a short distance behind first, and divided into two portions: a high anterior portion and a long low posterior portion. Anal fin commences a short distance behind anus, height not depressed along middle of its length. Caudal fin rounded. Pelvics reaching anus.

Measurements (in mm, % SL in parenthesis). Standard length 167.5-234.0; head length 27.6-36.5 (15.5-16.4), width 18.1-23.6 (9.8-10.8); body depth 28.4-45.1 (16.9-19.2); caudal peduncle depth 3.5-5.6 (2.0-2.4); orbit diameter 8.5-12.5 (5.0-5.3); interorbital width 7.2-10.6 (4.1-4.5); snout length 7.8-9.2 (3.9-4.6); maxilla length 12.5-15.4 (6.6-7.4); length of pectoral fin 21.1-27.2 (11.6-12.5); length of pelvic fin 16.1-19.2 (7.8-9.6); length of longest ray of first dorsal fin 10.2-13.8 (5.7-6.3), second dorsal fin 30.0-42.1 (17.6-19.4), third dorsal fin 5.0-8.6 (2.9-3.9); length of longest ray of anal fin 15.1-21.0 (8.4-9.0); predorsal length 35.5-44.3 (17.0-21.1); preanal length 45.2-59.6 (23.1-26.9).

Meristics. First dorsal fin rays 1 + 4-5; second dorsal fin rays 15-17; third dorsal fin rays 35-41; anal fin rays 103-105; pectoral fin rays 21-23; pelvic fin rays 5; oblique scale rows in longitudinal series 217-225; scales between origin of second dorsal fin and lateral line 14-15; gill rakers 3 + 11-12; vertebrae 69-71.

Coloration (from fresh and frozen specimens). Head silvery on sides, top and snout dark brown; body brownish grey; scale pockets on head and body brown; abdomen blue grey ventrally, becoming silvery laterally; first dorsal fin blue grey; second dorsal fin brown basally, blue grey in middle, black distally; third dorsal and anal fins blue grey, distal tips of rays black; caudal and pectoral fins black.

Coloration (from preserved specimens). Head and body pale tan with darker brown on snout and orbit, abdomen bluish with silvery sheen, fins dark blue-brown to black.

DISTRIBUTION. — *Tripterophycis svetovidovi* has been recorded from the Kit Range and Rui-Grande Peak in the South Atlantic Ocean, from the Madagascar Ridge in the Southern Indian Ocean and in the South Pacific Ocean off Australia and the Sala y Gomez Ridge off South America at 385-950 m depth (PARIN, 1985; SAZONOV & SHCHERBACHEV, 1986; COHEN *et al.*, 1990; PARIN, 1991; SAZONOV & PAKHORUKOV, 1992). This is the first record for New Caledonia, where to date it appears to be confined to seamount "B" (also known as "Banc Éponge").

REMARKS. — *Tripterophyscis svetovidovi* differs from its congener *T. gilchristi* Boulenger in having small, irregular, conical teeth in the jaws (vs close set, chisel-shaped or incisorform teeth); scales between origin of second dorsal fin and lateral line 14-15 (vs 11-12); and larger snout, its length 25.2-32.0% head length (vs 21.0-25.0% head length) (SAZONOV & SHCHERBACHEV, 1986; SAZONOV & PAKHORUKOV, 1992).

KEY TO MORID CODS RECORDED FROM NEW CALEDONIAN WATERS

(Note: Moridae distinguished from Eulichthyidae by having symmetrical anal and caudal fins)

- | | | |
|-----|--|------------------------------------|
| 1 | Three dorsal fins present | <i>Tripterophyscis svetovidovi</i> |
| 1' | Two dorsal fins present | 2 |
| 2 | Ventral light organ present; dermal window visible as round black area on belly (may be minute); abdomen deep bluish black in colour..... | 3 |
| 2' | No ventral light organ; body colour variable; belly rarely bluish | 8 |
| 3 | Chin barbel present | 4 |
| 3' | Chin barbel absent | 7 |
| 4 | Ventral fins long, reaching to midpoint of anal fin | <i>Physiculus longifilis</i> |
| 4' | Ventral fins short, not reaching beyond origin of anal fin | 5 |
| 5 | Scale rows in longitudinal series 90-95; vertebrae 46-49 | <i>Physiculus roseus</i> |
| 5' | Scale rows in longitudinal series 115-128; vertebrae 51-59..... | 6 |
| 6 | Light organ placed well behind level of insertion of pelvic fins; distance between light organ and anus ca. equal to diameter of light organ; -11 scales between first dorsal fin origin and lateral line..... | <i>Physiculus therosideros</i> |
| 6' | Light organ close to level of pelvic fin insertion; distance between light organ and anus approximately twice diameter of light organ; 11-16 scales between first dorsal fin origin and lateral line | <i>Physiculus luminosus</i> |
| 7 | Jaw teeth small, villiform, in bands; pectoral fin rays 19-23; orbit diameter 3.5-4.5% SL | <i>Gadella norops</i> |
| 7' | Jaw teeth large, canine-like, in a single row; pectoral fin rays 25-26; orbit diameter 4.7-5.3% | <i>Gadella brocca</i> sp. nov. |
| 8 | Pelvic fins with two rays | 8' |
| 8' | Pelvic fins with more than two rays, usually 5-7 | 9 |
| 9 | Pelvic fins reaching beyond anus; 61-65 second dorsal fin rays; 57-62 anal fin rays | <i>Laemonema palauense</i> |
| 9' | Pelvic fins not reaching anus; 51-56 second dorsal fin rays; 50-52 anal fins rays | <i>Laemonema filodorsale</i> |
| 10 | Prolonged ray of first dorsal fin greatly exceeding head length; anal fin single; orbit diameter small, less than length of chin barbel | <i>Lepidion inosimae</i> |
| 10' | Longest ray of first dorsal not greatly exceeding length of head; anal fin usually divided into two; orbit diameter large, greater than length of barbel..... | <i>Mora moro</i> |

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